REPORT OF AIR POLLUTION SOURCE TESTING OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM OPERATED BY STERIGENICS U.S., LLC. IN CHARLOTTE, NORTH CAROLINA ON DECEMBER 9, 2019

Submitted to:

MECKLENBURG COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION 700 North Tryon Street, Suite 205 Charlotte, North Carolina 28202-2236

Submitted by:

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Permit Number 14-017-959

Prepared by:

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Prepared on:

December 15, 2019



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TEST DATE

Monday, December 9, 2019

Oak Brook, Illinois 60523

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1.0 INTRODUCTION

On Monday, December 9, 2019, ECSi performed air pollution source testing of an ethylene oxide (EtO) emission-control system operated by Sterigenics U.S., LLC. in Charlotte, North Carolina. The control device tested is an Anguil catalytic oxidizer, which is currently used to control emissions from nine EtO sterilizer backvents and two aeration rooms. The purpose of the testing program was to evaluate continued compliance with EPA requirements under the current National Emissions Standards for Hazardous Air Pollutants (NESHAP), and with the conditions established in the Air Quality Permit granted to Sterigenics US, LLC. by the Mecklenburg County Department of Environmental Protection (MCDEP).



2.0 EQUIPMENT

The EtO gas-sterilization system is comprised of nine commercial sterilizers, all discharging through dry screw or liquid-ring vacuum pumps to an Advanced Air Technologies packed-tower acid scrubber emission control device. The nine sterilization chamber backvents and three aeration rooms are all discharged to an Anguil catalytic oxidizer emission-control device. The gas-sterilization and emission-control equipment consists of the following:

- Nine Gas Sterilizers, each comprised of a steam-heated sterilization chamber (varying in size from 2500 to 5300 cubic foot volume), a dry screw or liquid ring recirculating vacuum pump chamber evacuation system ("chamber vacuum vent"), and a backdraft valve ("chamber exhaust vent");
- Three aeration rooms, each comprised of a heated aeration chamber and a chamber exhaust system

Sterilizer vacuum pump emissions are controlled by:

 One Advanced Air Technologies Safe Cell emission-control system, comprised of a packed-tower chemical scrubber, equipped with a packed reaction/interface column, a scrubber fluid recirculation system, a scrubber fluid reaction/storage tank, and a dedicated blower exhaust system.

Sterilizer backvent and aeration cell/room emissions are controlled by:

• One Anguil Catalytic Oxidizer, rated at 10,000 SCFM, equipped with a prefilter, a natural gas heater, an exhaust gas heat exchanger, two reactive catalyst beds, and an exhaust blower.



3.0 TESTING

EtO source testing was performed in accordance with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in 40 CFR, Part 63.365, subpart O. EtO concentration measurement for each test run will be conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product. The testing program was conducted in accordance with the procedures outlined in the following sections.



4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at Sterigenics U.S., LLC. was tested to determine compliance with the current federal EPA National Emissions Standard for Hazardous Air Pollutants (NESHAP) for ethylene oxide, and with the requirements specified in the MCDEP Permit. The current testing was performed to demonstrate continued compliance with the following requirements:

- The emissions from the sterilization chamber exhaust vents (backvents) must be discharged to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight.
- The emissions from the aeration process must be discharged to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight.

Testing is required to demonstrate compliance with these requirements. Source testing of the emission-control device is required annually, in accordance with the conditions established in the permit granted by the MCDEP.

5.0 TEST METHOD REFERENCE

5.1 INTRODUCTION

EtO source testing was conducted in accordance with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in 40 CFR, Part 63.365, subpart O. EtO concentration measurement for each test run will be conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

Operation and documentation of process conditions were performed by personnel from Sterigenics using existing monitoring instruments installed by the manufacturer on the equipment to be tested. In accordance with USEPA CFR40, Part 63.364 (c), catalyst bed temperature was recorded, using the lone thermocouple installed by the equipment manufacturer to display the average/representative temperature immediately downstream of the bank of catalyst trays.

5.2 CONTROL EFFICIENCY MEASUREMENT

During backvent and aeration testing, EtO concentration at the inlet and outlet of the catalytic oxidizer were determined using direct source sample injection into the GC. Since the source gas flow is identical at the inlet and outlet of the catalytic oxidizer control-efficiency of EtO during aeration and backvent was calculated by comparing the concentration of EtO vented to the system inlet to the concentration of EtO vented from the system outlet.

CARB Method 431, Appendix A, specifies that catalytic oxidizer emission-control devices may be tested, and control efficiency determined, without volumetric flow measurement as long as the following criteria are met:

1) There is no dilution between the inlet and outlet sampling locations

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- 2) There is identical flow at the inlet and outlet sampling locations, and
- 3) There is constant flow throughout the duration of the compliance test.

These conditions were all met during the testing performed at Sterigenics. Specifically, condition 2 was met due to the extremely high flow rate of ambient air being drawn through the oxidizer (10,000 CFM) which, when compared to the relatively low flow rate of natural gas to the heater burner, renders the potential contribution of any fuel gas combustion products to the outlet flow rate to be extremely negligible. In addition, emissions testing for combustion products performed on similar gas-fired catalytic oxidizers used to control EtO emissions has demonstrated that the exhaust gas composition at the outlet of the oxidizer contains moisture, oxygen, carbon dioxide, and carbon monoxide at ambient levels, and that any deviations are at low ppmv levels. This is further proof that the potential contribution of any fuel gas combustion products to the outlet flow rate is insignificant.

During the backvent and aeration phases, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO concentration, and a photoionization detector (PID) was used to quantify low-level EtO concentration at the emission-control device outlet.

5.3 SAMPLE TRANSPORT

Source gas was pumped to the GC at approximately 1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon® sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet, the sampling port was located in the common backvent/aeration discharge duct, upstream of the oxidizer. At the outlet of the catalytic oxidizer, sampling ports were located in the exhaust stack downstream of the catalyst bed.

5.4 GC INJECTION

Source-gas samples were then injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately five-minute intervals during the aeration-phase testing. Helium was the carrier gas for both the FID and PID.



5.5 GC CONDITIONS

The packed columns for the GC were both operated at 90 degrees C. The columns were stainless steel, 6 feet long, 0.125-inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B. During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were helium (99.999% pure), hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

5.6 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

- 1) 1,000 ppmv EtO, balance nitrogen
- 2) 100 ppmv EtO, balance nitrogen
- 3) 50 ppmv EtO, balance nitrogen (audit gas)
- 4) 10 ppmv EtO, balance nitrogen
- 5) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analyses using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix I.

5.7 SAMPLING DURATION

Backvent testing was performed in conjunction with normal production operations, during the chamber exhaust venting which is conducted for each sterilization chamber upon conclusion of the sterilization cycle,

immediately prior to and during chamber unloading. Backvent sampling duration was 15 minutes for each of the three test runs.

Since aeration is a 24-hour process at this facility, with constant discharge flow from the aeration chambers to the emission-control system, aeration testing consisted of three 1-hour test runs. Each test run was performed with freshly sterilized product in the aeration chambers.

5.8 CONTROL-EFFICIENCY CALCULATIONS

Control efficiency of EtO was calculated for aeration and backvent, using the following CARB-approved equation:

Efficiency = $(C_i - C_o / C_i)(100)$

Which is a mathematical simplification of the following equation from CARB Method 431, with the identical inlet/outlet flow value removed:

Efficiency = $(W_i - W_o / W_i)(100)$

Where:

 W_i = Mass flow rate to the control device inlet, pounds, calculated as $(C_i)(F_i)$

Where:

C_i = EtO concentration at the control device inlet

 F_i = Flow rate at the control device inlet

 W_o = Mass flow rate from the control device outlet, pounds, calculated as $(C_o)(F_o)$

Where:

C_o = EtO concentration at the control device outlet

F_o = Flow rate at the control device outlet

Results of the control-efficiency testing are presented in Section 8.0, and in Tables 1 and 2.

6.0 TEST SCENARIO

The backvent and aeration testing was performed during normal process load conditions. Three backvent and three aeration test runs were conducted in series to verify the performance of the emission-control device. The testing schedule was as follows:

- 1) Testing equipment was set up and calibrated.
- 2) Backvent Phase Test Run #1 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 3) Aeration Phase Test Run #1 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 4) Backvent Phase Test Run #2 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 5) Aeration Phase Test Run #2 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 6) Backvent Phase Test Run #3 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 7) Aeration Phase Test Run #3 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 8) Post calibration check was performed, testing equipment was packed.



7.0 QA/QC

7.1 FIELD TESTING QUALITY ASSURANCE

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the sample line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

7.2 CALIBRATION PROCEDURES

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the Peaksimple II analytical software, a calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix I.



8.0 TEST RESULTS

The catalytic oxidizer was found to have an average EtO control efficiency of 99.97 percent for backvent, and an average EtO control efficiency of 99.96 percent for aeration. In accordance with state and federal requirements, backvent and aeration discharge streams must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 percent by weight. The catalytic oxidizer met this requirement.

The test results are summarized in Tables 1 and 2. These tables include results for EtO control efficiency of the emission-control device. Chromatograms and chromatographic supporting data are attached as Appendices A through G. Copies of field data and calculation worksheets are attached as Appendix H.



TABLES

TABLE 1 ETHYLENE OXIDE CONTROL EFFICIENCY - BACKVENT OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS U.S., LLC. IN CHARLOTTE, NORTH CAROLINA ON DECEMBER 9, 2019

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	1044	61.2	0.021	99.97
1 ′	1046	103	0.021	99.98
1	1047	85.3	0.021	99.98
1	1049	82.0	0.021	99.97
1	1050	80.0	0.021	99.97
1	1051	80.8	0.021	99.97
1	1052	80.0	0.021	99.97
1	1053	79.8	0.021	99.97
1	1054	79.1	0.021	99.97
1	1056	81.9	0.021	99.97
1	1057	72.7	0.021	99.97
1	1058	71.5	0.021	99.97
2(4)	1255	61.7	0.021	99.97
2	1256	61.0	0.021	99.97
2	1257	61.5	0.021	99.97
2	1259	60.3	0.021	99.97
2	1300	60.6	0.021	99.97
2	1301	60.8	0.021	99.97
2	1302	60.3	0.021	99.97
2	1303	59.4	0.021	99.96
2	1305	61.0	0.021	99.97
2	1306	60.1	0.021	99.97
2	1307	59.0	0.021	99.96
2	1308	59.2	0.021	99.96
3(5)	1419	57.6	0.021	99.96
3	1420	176	0.021	99.99
3	1421	119	0.021	99.98
3 3	1422	95.0	0.021	99.98
3	1424	91.4	0.021	99.98
3 3	1425	90.9	0.021	99.98
3	1426	64.4	0.021	99.97
3	1427	58.6	0.021	99.96
3	1428	58.7	0.021	99.96
3 3	1430	56.8	0.021	99.96
	1431	56.4	0.021	99.96
3	1433	<u>56.5</u>	<u>0.021</u>	<u>99.96</u>
TIME-W	/EIGHTED AVERAGE:	73.99	0.0210	99.97

MCDEP REQUIRED CONTROL EFFICIENCY:

Notes:

- (1) PPM = parts per million by volume
- (2) 0.021 ppm is the quantification limit for the detector used at the outlet.
- (3) Backvent Phase Test Run #1 started at 10:43, ended at 10:58 (catalyst bed temp @ 302 degF)
- (4) Backvent Phase Test Run #2 started at 12:54, ended at 13:08 (catalyst bed temp @ 302 degF)
- (5) Backvent Phase Test Run #3 started at 14:18, ended at 14:33 (catalyst bed temp @ 302 degF)

99%

TABLE 2 ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS U.S., LLC. IN CHARLOTTE, NORTH CAROLINA ON DECEMBER 9, 2019

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	1101	70.3	0.021	99.97
1	1106	64.9	0.021	99.97
1	1111	60.4	0.021	99.97
1	1116	59.1	0.021	99.96
1	1121	58.7	0.021	99.96
1	1126	58.7	0.021	99.96
1	1131	56.8	0.021	99.96
1	1136	56.4	0.021	99.96
1	1141	57.3	0.021	99.96
1	1146	59.5	0.021	99.96
1	1151	59.0	0.021	99.96
1	1156	59.2	0.021	99.96
2(4)	1311	57.5	0.021	99.96
2	1316	59.9	0.021	99.96
2 2	1321	59.1	0.021	99.96
2	1326	59.6	0.021	99.96
2	1331	59.0	0.021	99.96
2	1336	59.5	0.021	99.96
2	1341	59.0	0.021	99.96
2	1346	58.3	0.021	99.96
2	1351	57.8	0.021	99.96
2	1356	58.3	0.021	99.96
2	1401	58.1	0.021	99.96
2	1406	59.1	0.021	99.96
3(5)	1436	57.0	0.021	99.96
3	1441	55.4	0.021	99.96
3	1446	55.6	0.021	99.96
3	1451	56.7	0.021	99.96
3	1456	56.1	0.021	99.96
3	1501	55.7	0.021	99.96
3	1506	54.7	0.021	99.96
3	1511	54.5	0.021	99.96
3 3	1516	54.7	0.021	99.96
3	1521	55.2	0.021	99.96
3	1526	55.6	0.021	99.96
3	1531	<u>54.6</u>	<u>0.021</u>	<u>99.96</u>
TIME-W	EIGHTED AVERAGE:	58.09	0.0210	99.96

MCDEP REQUIRED CONTROL EFFICIENCY:

Notes:

- (1) PPM = parts per million by volume
- (2) 0.021 ppm is the quantification limit for the detector used at the outlet.
- (3) Aeration Phase Test Run #1 started at 10:59, ended at 11:59 (catalyst bed temp @ 302 degF)
- (4) Aeration Phase Test Run #2 started at 13:09, ended at 14:09 (catalyst bed temp @ 302 degF)
- (5) Aeration Phase Test Run #3 started at 14:34, ended at 15:34 (catalyst bed temp @ 302 degF)

99%

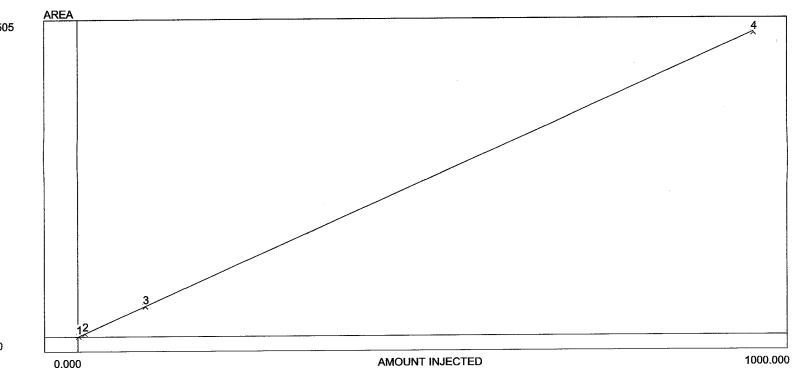
APPENDICES

APPENDIX A

Calibration Data



component file: eto i- too.cpt Calibration Int.Std Units
0.000
0.000
C:\peak454-64bit\0.000\1SppmLT2019.CAL
0.000 Peak Name Start
Dead Vol / Air 0.000
Ambient H2O 0.280
Ethylene Oxide 0.400
Acetaldehyde 0.550 End 0.280 0.400 0.550



Avg slope of curve: 0.51 Y-axis intercept: 0.00 Linearity: 1.00 Number of levels: 4 SD/rel SD of CF's: 0.0/1.3 Y=0.5073X

2: 1.0000

ast calibrated: Mon Dec 09 07:27:09 2019

.vi. Area/ht.	Amount	CF	Current	Previou	s #1Previous #2
0.610	1.180	0.517	0.610	N/A	N/A
2 5.117	10.200	0.502	5.117	N/A	N/A
50.530	100.000	0.505	50.530	N/A	N/A
4 505.300	1000.000	0.505	505.300	N/A	N/A

 Peak
 Name
 Start
 End
 Calibration
 Int.Std
 Units

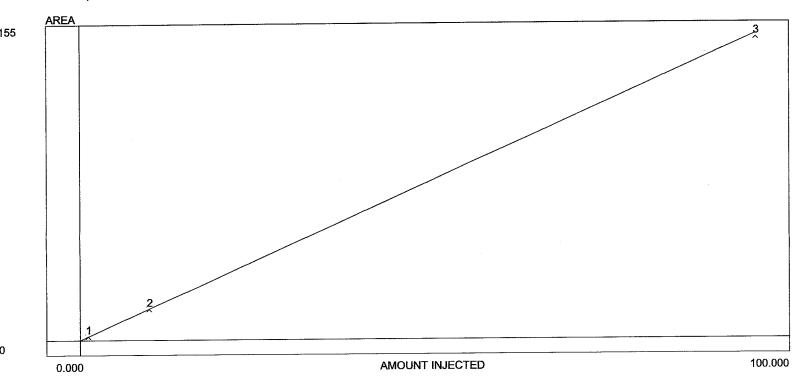
 Dead Vol / Air
 0.000
 0.280
 0.000

 Ambient H2O
 0.280
 0.400
 0.000

 Ethylene Oxide
 0.400
 0.550
 C:\peak454-64bit\0.000\2SppmLT2019.CAL

 Acetaldehyde
 0.550
 1.000
 0.000

component me. etoz-100.cpt



Avg slope of curve: 1.57 Y-axis intercept: 0.00 Linearity: 1.00 Number of levels: 3 SD/rel SD of CF's: 0.0/1.6 Y=1.5713X

r2: 1.0000

Last calibrated: Mon Dec 09 07:03:44 2019

1 1.887 2 15.930	Amount 1.180 10.200 100.000	CF 1.599 1.562 1.553	Current 1.887 15.930 155.300	N/A N/A	s #1Previous #2 N/A N/A N/A
3 155.300	100.000	1.553	155.300	N/A	N/A

Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-Amb.CHR (c:\peak359) Data file: 1SterCLT2019-Amb.CHR (c:\peak359) Sample: Ambient Background Sample: Ambient Background Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 32.000 -3.200 -3.200 0.0000/ 50.1600/0.100 > 3.3655/0.216 Dead Vol / Air 0.0000/ 0.1115/0.883 External Units External Units Component Retention Area Retention Area Component 0.0000 0.0000 Dead Vol / Air 0.100 50.1600 0.216 3.3655

Ambient H2O

0.0000

0.0000

0.1115

3.4770

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

0.0000

241.5580

291.7180

0.366

Client ID: PreCal

Analysis date: 12/09/2019 06:10:33 Method: Direct Injection Description: CHANNEL 2 - PID

Lab Hairie. ECO

Dead Vol / Air

Acetaldehyde

Client ID: PreCal

Analysis date: 12/09/2019 06:10:33 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Components: eto1-100.cpt Data file: 2SterCLT2019-C01.CHR (c:\peak359)
Sample: Ambient-Background 100 ppm 610
Operator: D. Kremer Data file: 1SterCLT2019-C01.CHR (c:\peak359)
Sample: Ambient Background (00 ppr 4 to
Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 512.000 -51.200 -12.800 External/Units |0.0000/ Component Dead Vol / Air Component 12.8380/0.016 0.0000 0.5320/0.050 Dead Vol / Air 0.0000/ 11.6300/0.283 0.0000/ Ambient H2O 0.2120/0.283 0.0000/ppm - 155.0420/0.483 0.0000/ppm - 50.8075/0.500 0.0000 Retention Area External Units Component External Units Retention Area Component 0.0000 0.016 12.8380 0.0000 Dead Vol / Air 0.050 0.5320 Dead Vol / Air 0.0000 0.0000 ppm 11.6300 0.283 Ambient H2O 0.0000 Ambient H2O 0.283 0.2120 155.0420 0.483 Ethylene Oxide 0.0000 ppm 0.500 50.8075 Ethylene Oxide 0.1380 0.0000 0.850 Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

179.6480

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:17:44

Method: Direct Injection

Description: CHANNÉL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Lab name. Eco

Client ID: PreCal

Analysis date: 12/09/2019 06:17:44

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

51.5515

Data file: 2SterCLT2019-C02 CHR (c:\peak359) Data file: 1SterCLT2019-C02.CHR (c:\peak359) Sample: Ambient Background 100 ppm std Sample: Ambient Background 100 pm std Operator: D. Kremer Operator: D. Kremer 512.000 -51.200 128,600 -12.800 emat/Units Component 0.0000/ 0,9120/0.050 Dead Vol / Air 0.0000/ 11.4890/0.100 Dead Vol / Air 0.0000/ Ambient H2O 0.1720/0.300 0.0000/ppm 156.3605/0.483 O OOOO/ooo **50.1310/0.500** Ethylene Oxide 0.0000/ 0.1590/0.783 Acetaldehyde External Units Retention Area External Units Component Retention Area Component 11.4890 0.0000 0.100 0.0000 Dead Vol / Air 0.050 0.9120 Dead Vol / Air 0.283 8.2665 0.0000 Ambient H2O Ambient H2O 0.300 0.1720 0.0000 0.0000 ppm 156.3605 Ethylene Oxide 0.483 0.0000 ppm Ethylene Oxide 0.500 50.1310

Acetaidehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.1590

176.2750

0.783

0.0000

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:20:33

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Lab hanie. Loc

Client ID: PreCal

Analysis date: 12/09/2019 06:20:33

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

51.2150

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-C03.CHR (c:\peak359) Data file: 1SterCLT2019-C03.CHR (c:\peak359) Sample: Ambient Background 100 ppm std Sample: Ambient Background 100 ppm 50 Operator: D. Kremer Operator: D. Kremer 512.000 -51,200 -12.800 Component Dead Vol / Air 12.4885/0.016 0000 1.1060/0.066 Dead Vol / Air 0.0000/ 9.3185/0.300 Ambient H2O 155.2200/0.500 0.0000/ppm 0.0000/ppm 50.6670/0.500 0.0000/ Acetaldehyde 0.5950/0.833 External Units External Units Component Retention Area Component Retention Area 0.0000 Dead Vol / Air 0.016 12.4885 0.0000 Dead Vol / Air 0.066 1.1060 0.0000 9.3185 Ambient H2O 0.300 50.6670 0.0000 ppm Ethylene Oxide 0.500 155.2200 0.0000 ppm Ethylene Oxide 0.500 0.0000 Acetaldehyde 0.833 0.5950 51.7730 0.0000

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

177.6220

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:22:51 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Lab hame. Ecol

Client ID: PreCal

Analysis date: 12/09/2019 06:22:51 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-C04.CHR (c:\peak359) Data file: 1SterCLT2019-C04.CHR (c:\peak359)
Sample: 10.2 ppm std Sample: 10.2 ppm std Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 32.000 -3.200 external/Units Component Dead Vol / Air 0.0000/ 12.8850/0.033 3.5845/0.216 0.0000/ppm > 15.9800/0.500 0.0000/ppm 0.0000/ 1,1460/0.666 External Units External Units Component Retention Area Component Retention Area 12.8850 0.0000 Dead Vol / Air 0.033 0.0000 3.5845 Dead Vol / Air 0.216 0.0000 ppm 15.9800 Ethylene Oxide 0.500 0.516 5.0985 0.0000 ppm

0.0000

8.6830

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.666

0.0000

0.0000

1.1460

30.0110

Client ID: PreCal

Analysis date: 12/09/2019 06:28:50 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Lab name: ECSI

Client ID: PreCal

Analysis date: 12/09/2019 06:28:50 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-C05.CHR (c:\peak359) Data file: 1SterCLT2019-C05.CHR (c:\peak359) Sample: 10.2 ppm std Sample: 10.2 ppm std Operator: D. Kremer Operator: D. Kremer 128.000 32,000 -12.800 -3.200 External/Units Component 0.9490/0.050 0.0000/ Dead Vol / Air 0.0000/ 11.4740/0.250 Dead Vol / Air 0.0000/ppm Ethylene Oxide 15.9290/0.483 0.0000/ppm > 5.1170/0.500 0.0000/ 0.2685/0.733 Retention Area External Units Component Retention Area External Units Component

Dead Vol / Air

Acetaldehyde

Ethylene Oxide

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.250

0.483

0.733

11.4740

15.9290

0.2685

27.6715

0.0000

0.0000

0.0000

0.0000 ppm

Client ID: PreCal

Analysis date: 12/09/2019 06:33:12 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Lab name: ECSI

Client ID: PreCal

Analysis date: 12/09/2019 06:33:12 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.050

0.500

Dead Vol / Air

Ethylene Oxide

0.9490

5.1170

6.0660

0.0000

0.0000

0.0000 ppm

Data file: 2SterCLT2019-C06.CHR (c:\peak359) Data file: 1SterCLT2019-C06.CHR (c:\peak359)
Sample: 10.2 ppm std Sample: 10.2 ppm std Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -3.200 Component Dead Vol / Air 0.9635/0.050 Dead Vol / Air 0.0000/ppm 0.0000/ppm Ethylene Oxide > 5.1310/0.500 Ethylene Oxide 0.0000/ 0.0000/ 0.3860/0.700 External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.016 11.6330 0.0000 0.0000 Dead Vol / Air 0.050 0.9635 0.0000 ppm 0.0000 ppm Ethylene Oxide 0.483 15.9100 0.500 5.1310 Ethylene Oxide 0.0000 Acetaldehyde 0.700 0.3860

0.0000

6.0945

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

27.9290

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:39:39 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Lab name. Econ

Client ID: PreCal

Analysis date: 12/09/2019 06:39:39 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Components: eto1-100.cpt Data file: 2SterCLT2019-C07.CHR (c:\peak359) Data file: 1SterCLT2019-C07.CHR (c:\peak359) Sample: 1.18 ppm std Sample: 1.18 ppm std Operator: D. Kremer Operator: D. Kremer 128.000 8.000
___External/Units Component -12.800 -0.800 0.0000/ 14.0925/0.183 Dead Vol / Air 0.0000/ 0.1065/0.216 0.0000/ppm 0.0000/ 1.8940/0.500 9.1010/0.550 0.0000/ppm Ethylene Oxide 0.6060/0.500 0.3960/0.566 o nono/ 0.1970/0.866 External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.183 14.0925 0.0000 0.0000 Dead Vol / Air 0.216 0.1065 0.0000 ppm 0.0000 ppm 1.8940 Ethylene Oxide 0.500 0.500 0.6060 Ethylene Oxide 0.0000 Acetaldehyde 0.866 0.1970 0.566 0.3960 0.0000 Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

16.1835

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:47:25 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Lab hame. Eco

Client ID: PreCal

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 06:47:25 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

1.1085

Components: eto1-100.cpt Data file: 2SterCLT2019-C08.CHR (c:\peak359) Data file: 1SterCLT2019-C08.CHR (c:\peak359) Sample: 1.18 ppm std Sample: 1.18 ppm std Operator: D. Kremer Operator: D. Kremer 8.000 -12.800 -0.800 Component Dead Vol / Air 12.6715/0.016 0.0000/ 0.2180/0.216 Dead Vol / Air 0.0000/ Ambient H2O 10.6275/0.283 0.0000/ppm 0.0000/ 0.0000/ppm 1.8930/0.500 > 9.3930/0.550 > 0.6130/0.500 Ethylene Oxide .0000/ 0.4180/0.566 0.0000/ 0.1975/0.800 External Units External Units Component Retention Area Retention Area Component 0.0000 Dead Vol / Air 0.016 12.6715 0.0000 0.2180 Dead Vol / Air 0.216 0.0000 10.6275 0.0000 ppm 0.283 Ambient H2O Ethylene Oxide 0.500 0.6130

0.0000

0.0000

0.4180

1.2490

Ethylene Oxide

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

0.800

1.8930

0.1975

25.3895

0.0000 ppm

0.0000

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 06:51:26

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Lab hante. Los

Client ID: PreCal

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.566

Analysis date: 12/09/2019 06:51:26

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Acetaldehyde

Components: eto1-100.cpt Data file: 2SterCLT2019-C09.CHR (c:\peak359) Data file: 1SterCLT2019-C09.CHR (c:\peak359) Sample: 1.18 ppm std Sample: 1.18 ppm std Operator: D. Kremer Operator: D. Kremer -12.800 8.000 -0.800 External/Units Component Dead Vol / Air 0.0000/ 0.1410/0.216 Dead Voi / Air 0.0000/ppm .8760/0.483 Ethylene Oxide 0.0000/ppm > 0.6110/0.500 Ethylene Oxide 0.0000/ 11.4860/0.550 0.0000/ 0.2465/0.566 0.0000/ External Units Retention Area External Units Component Retention Area Component 0.0000 0.016 8.9450 0.0000 Dead Vol / Air 0.216 0.1410 Dead Vol / Air

Ethylene Oxide

Acetaldehyde

0.0000 ppm

0.0000

0.0000

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000 ppm

0.0000

0.0000

1.8760

0.5545

11.3755

0.483

0.750

Client ID: PreCal

Analysis date: 12/09/2019 06:56:19

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Lab Haille. Looi

Client ID: PreCal

Analysis date: 12/09/2019 06:56:19

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

0.566

0.6110

0.2465

Lab name: ECS Client: Sterigenics - Charlotte Client ID: PreCal

Analysis date: 12/09/2019 07:06:26 Method: Direct Injection Description: CHANNÉL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterCLT2019-C10.CHR (c:\peak359)

Sample: 52.0 ppm std Operator: D. Kremer

Client ID: PreCal Analysis date: 12/09/2019 07:06:26

Method: Direct Injection Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Client: Sterigenics - Charlotte

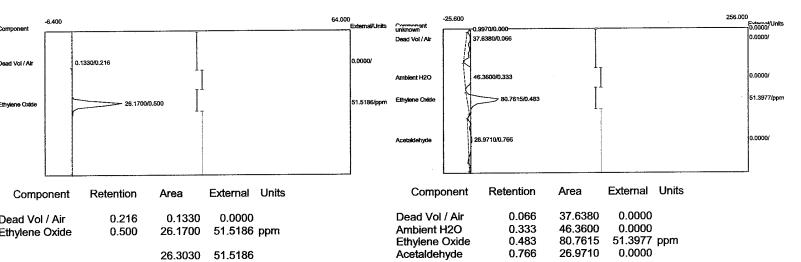
Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterCLT2019-C10.CHR (c:\peak359)

191.7305 51.3977

Sample: 52.0 ppm std Operator: D. Kremer



Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100 cpt Data file: 2SterCLT2019-C11.CHR (c:\peak359) Data file: 1SterCLT2019-C11.CHR (c:\peak359) Sample: 52.0 ppm std Sample: 52.0 ppm std Operator: D. Kremer Operator: D. Kremer Comments: Sample Line Bias Cal Comments: Sample Line Bias Cal 64.000 256.000 -25.600 -6.400 0.00000/Units unknown 0.0000/ 7.8200/0.266 0.0000/ 51,3274/ppm 0.0000/ 2.0390/0.850

Component

Dead Vol / Air

Acetaldehyde

Ethylene Oxide

External Units

52.0659 ppm

0.0000

52.0659

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Retention

0.266

0.483

0.850

Area

7.8200

80.6510

2.0390

90.5100 51.3274

External Units

51.3274 ppm

0.0000

0.0000

Client ID: PreCal

Analysis date: 12/09/2019 07:10:18

Method: Direct Injection

Description: CHANNÉL 2 - PID

Carrier: HELIUM

Lab name: ECSI

Client ID: PreCal

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Retention

0.200

0.483

Area

0.1360

26.4480

26.5840

Analysis date: 12/09/2019 07:10:18

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Component

Dead Vol / Air

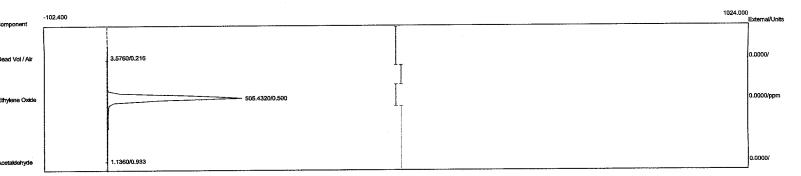
Ethylene Oxide

Lab Hattle. LCG Client: Sterigenics - Charlotte Client ID: PreCal

Analysis date: 12/09/2019 07:16:47 Method: Direct Injection
Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1SterCLT2019-C12.CHR (c:\peak359)
Sample: 1000 ppm std
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	3.5760	0.0000	
Ethylene Oxide	0.500	505.4320	0.0000	ppm
Acetaldehyde	0.933	1.1360	0.0000	

0.0000 510.1440

External Units

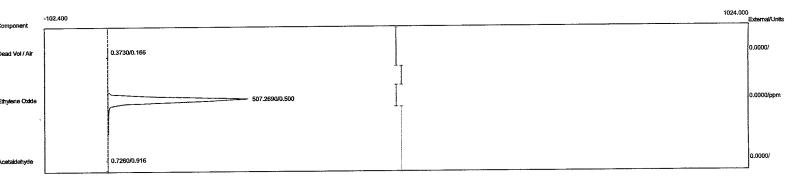
Lab name: ECSI Client: Sterigenics - Charlotte Client ID: PreCal Analysis date: 12/09/2019 07:18:54 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto1-100.cpt
Data file: 1SterCLT2019-C13.CHR (c:\peak359)
Sample: 1000 ppm std

Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air Ethylene Oxide Acetaldehyde	0.166 0.500 0.916	0.3730 507.2690 0.7260	0.0000 0.0000 0.0000	ppm
		508.3680	0.0000	

Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 15terCLT2019-C14.CHR (c:\peak359)
Sample: 1000 ppm std
Operator: D. Kremer

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Lab name: ECSI

Dead Vol / Air

Ethylene Oxide

Client ID: PreCal

Analysis date: 12/09/2019 07:23:11 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.233

0.516

0.0000

0.0000

0.0000 ppm

0.1010 503.5645

Data file: 2SterCLT2019-C12.CHR (c:\peak359) Data file: 1SterCLT2019-C15.CHR (c:\peak359) Sample: 1.18 ppm std Sample: 100 ppm std Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 128.000 -12.800 0.0000/ 13.8680/0.133 Dead Vol / Air 0.0000/ 0.1970/0.216 Dead Vol / Air 0.0000/ 0.1240/0.283 0.0000/ .1930/0.383 1.1885/ppm 1.8675/0.500 100.5157/ppm Ethylene Oxide 50.9920/0.500 0.0000/ 6.4815/0.566 External Units Retention Component Retention Area External Units Component 0.0000 Dead Vol / Air 0.133 13.8680 0.216 0.1970 0.0000 Dead Vol / Air 0.0000 4.1930 Ambient H2O 0.383 0.1240 0.0000 Ambient H2O 0.283

Ethylene Oxide

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

1.8675

6.4815

26,4100

0.500

0.566

1.1885 ppm

0.0000

1.1885

Client ID: PostCal

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 12:38:03 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: PostCal

Analysis date: 12/09/2019 12:43:59 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

50.9920 100.5157 ppm

51.3130 100.5157

APPENDIX B

Run #1 Chromatograms – Backvent



Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B01.CHR (c:\peak359) Data file: 1SterCLT2019-1B01.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 64.000 -6.400 0.0000/Units 2.3200/0.233 0.0000/ Dead Vol / Alt 0.0000/ 61,2355/ppm External Units External Units Component Retention Area Retention Area Component 0.0000 0.0000 Ambient H2O 0.366 234.4430 0.233 2.3200 Dead Vol / Air

61.2355 ppm

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

234.4430

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 12/09/2019 07:44:16 Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.516

31.0650

33.3850 61.2355

Analysis date: 12/09/2019 07:44:16 Method: Direct Injection Description: CHANNEL 1 - FID

Client ID: Run#1BV

Carrier: HELIUM

Ethylene Oxide

Client: Sterigenics - Charlotte Client ID: Run#1BV Analysis date: 12/09/2019 07:46:23 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Lab hame. ECS

Data file: 1SterCLT2019-1B02.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Client ID: Run#1BV Analysis date: 12/09/2019 07:46:23

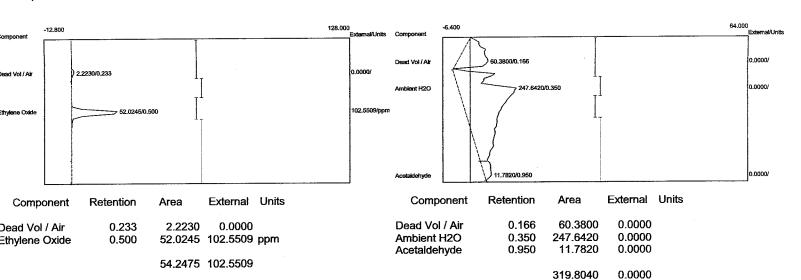
Client: Sterigenics - Charlotte

Method: Direct Injection Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterCLT2019-1B02.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B03.CHR (c:\peak359) Data file: 1SterCLT2019-1B03.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 -25.600 -12.800 128.000 5.0000/Units 2.3200/0.216 0.0000/ 46.5165/0.350 0.0000/ 85.2812/ppm 0.0000/ 42.3865/0.700 External Units Retention

Component

Ambient H2O Acetaldehyde

Lab Haine. Looi

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 12/09/2019 07:47:58 Method: Direct Injection

Description: CHANNÉL 2 - PID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Area

146.5165

188.9030

42.3865

0.350

0.700

0.0000

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1BV Analysis date: 12/09/2019 07:47:58

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Retention

0.216

0.500

Component

Dead Vol / Air

Ethylene Oxide

Area

2.3200

43.2635

45.5835

External Units

85.2812 ppm

0.0000

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B04.CHR (c:\peak359) Data file: 1SterCLT2019-1B04.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128,000 External/Units 64.000 -6.400 -12.800 0.0000/ 33,2365/0.183 Dead Voi / Air 2.1190/0.233 0.0000/ 242,7950/0.366 41.6170/0.516 Component Retention Area External Units External Units Component Retention Area Dead Vol / Air 0.183 33.2365 0.0000 0.0000 Dead Voi / Air 0.233 2.1190 0.0000 Ambient H2O 0.366 242.7950 82.0356 ppm

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

276.0315

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:49:26 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab name. Ecoi

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 07:49:26 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.516

41.6170

43.7360 82.0356

Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B05.CHR (c:\peak359)
Sample: Oxidizer Outlet Data file: 1SterCLT2019-1B05.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 64.000 Fytomol/Units -6.400 128.000 -12.800 2,2790/0,216 225.0470/0.350 0.0000/ Ambient H2O 79.9826/ppn External Units External Units Component Retention Area Retention Area Component 0.0000 0.0000 Ambient H2O 0.350 225.0470 2.2790 Dead Vol / Air 0.216

79.9826 ppm

79.9826

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

225.0470

0.0000

Client ID: Run#1BV Analysis date: 12/09/2019 07:50:29

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Lap Haine. Looi

Ethylene Oxide

Client ID: Run#1BV Analysis date: 12/09/2019 07:50:29

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

40.5755

Components: eto2-100.cpt
Data file: 2SterCLT2019-1B06.CHR (c:\peak359) Components: eto1-100.cpt Data file: 1SterCLT2019-1B06.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 128.000 -25.600 -12.800 Composent unknown Dead Vol / Air 0.0000/ 2.2720/0.233 Ambient H2O 191.6910/0.366 30.7800/ppm Retention External Units Component Area Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.050

0.366

0.0000

0.0000

0.0000

33.4330

191.6910

225.1240

Client ID: Run#1BV Analysis date: 12/09/2019 07:51:35

Carrier: HELIUM Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab hame. Ecoi

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 07:51:35

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.233

0.516

2.2720

40.9800

43.2520

0.0000

80.7800

80.7800 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B07.CHR (c:\peak359) Data file: 1SterCLT2019-1B07.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128,000 128,000 -12.800 External/Units 2.3050/0.216 0.0000/ 252.2515/0.333 80.0211/ppm Retention Area External Units Component Component Retention Area External Units 0.333 252.2515 0.0000 Ambient H2O 0.0000 Dead Vol / Air 0.216 2.3050 40.5950 80.0211 ppm Ethylene Oxide 0.500

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

252.2515

0.0000

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:52:42 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:52:42 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

42.9000

Components: eto1-100.cpt Data file: 2SterCLT2019-1B08.CHR (c:\peak359) Data file: 1SterCLT2019-1B08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -12.800 128.000 128,000 -12.800 External/Units 34.3835/0.150 0.0000/ Dead Vol / Air 0.0000/ Dead Vol / Air 2.2470/0.216 0.0000/ Ambient H2O 79.7924/ppm 40.4790/0.500 Retention External Units Component Area Component Retention Area External Units 0.150 34.3835 0.0000 Dead Vol / Air Dead Vol / Air 0.216 2.2470 0.0000

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

207.2660

241.6495

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 07:53:48

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1BV

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 07:53:48

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

40.4790

42.7260

79.7924 ppm

Components: eto2-100.cpt
Data file: 2SterCLT2019-1B09.CHR (c:\peak359) Components: eto1-100.cpt Data file: 1SterCLT2019-1B09 CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 50.0000/Units 0,0000/ 2.2010/0.216 0.0000/ 227.2720/0.350 79.1330/ppm 40.1445/0.500 External Units Component Retention Area External Units Component Retention Area 0.350 227.2720 0.0000 Ambient H2O 0.0000 Dead Vol / Air 0.216 2.2010

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

227.2720

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:54:55

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECOI

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:54:55

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

Ethylene Oxide

40.1445

42.3455 79.1330

79.1330 ppm

Client: Sterigenics - Charlotte Client: Sterigenics - Charlotte Client ID: Run#1BV Client ID: Run#1BV Analysis date: 12/09/2019 07:56:01 Method: Direct Injection Analysis date: 12/09/2019 07:56:01 Method: Direct Injection Description: CHANNÉL 2 - PID Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 1SterCLT2019-1B10.CHR (c:\peak359) Sample: Oxidizer Inlet

Operator: D. Kremer

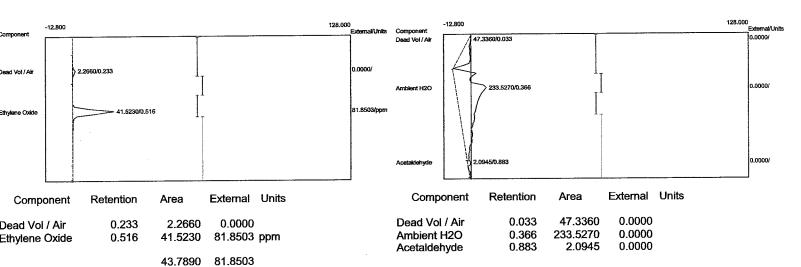
Lap name: ECSI

Data file: 2SterCLT2019-1B10.CHR (c:\peak359)

282.9575

0.0000

Sample: Oxidizer Outlet Operator: D. Kremer



Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B11.CHR (c:\peak359) Data file: 1SterCLT2019-1B11.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.900 External/Units 256.000 -25.600 -12.800 0.0000/Units 0.0000/ Dead Vol / Air 2.1370/0.200 0.0000/ 0.0000/ 242.7990/0.333 72,6517/ppm Component Retention Area External Units External Units Component Retention Area 37.4620 Dead Vol / Air 0.150 0.0000

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

242.7990

280.2610

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 07:57:11

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. ECSI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 07:57:11

Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.200

0.483

0.0000

72.6517 ppm

2.1370

36.8565

38.9935 72.6517

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1B12.CHR (c:\peak359) Data file: 1SterCLT2019-1B12.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units |0.0000/ -12.800 -12.800 Component Dead Vol / Air 38.9790/0.016 0.0000/ 202.5700/0.333 71.5114/ppm 0.0000/ External Units Component Retention Area External Units Component Retention Area

Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.016

0.333

0.816

38.9790

9.6095

202.5700

251.1585

0.0000

0.0000

0.0000

0.0000

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 12/09/2019 07:58:18 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1BV

Carrier: HELIUM

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 07:58:18 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.216

0.500

0.0000

71.5114 ppm

2.1790

36.2780

38.4570 71.5114

APPENDIX C

Run #1 Chromatograms – Aeration



Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A01.CHR (c:\peak359) Data file: 1SterCLT2019-1A01.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Sample: Oxidizer Outlet Operator: D. Kremer 128.000 128.000 -12.800 0.0000/Units 0.0000/ 2.2155/0.216 0.0000/ 70.3444/ppm Component Retention Area External Units External Units Component Retention Area Ambient H2O 0.350 228.7610 0.0000 0.0000 Dead Vol / Air 0.216 2.2155 35.6860 70.3444 ppm Ethylene Oxide 0.500 0.0000 228.7610

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#1Aer

Carrier: HELIUM

Analysis date: 12/09/2019 08:01:13 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. ECS

Client ID: Run#1Aer

Carrier: HELIUM

Analysis date: 12/09/2019 08:01:13 Method: Direct Injection

Client: Sterigenics - Charlotte

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

37.9015 70.3444

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A02.CHR (c:\peak359) Data file: 1SterCLT2019-1A02.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 256,000 -25.600 -12.800 0.0000/ 48.0720/0.200 Dead Vol / Air 2.1330/0.233 0.0000/ 0.0000/ Ambient H2O 195,1035/0.366 64.9295/ppm 0.0000/ 32.8920/0.833 External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.200 48.0720 0.0000 0.0000 Dead Vol / Air 0.233 2.1330 0.0000

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.366

0.833

195.1035

276.0675

32.8920

0.0000

0.0000

Client ID: Run#1Aer Analysis date: 12/09/2019 08:06:11 Method: Direct Injection

Carrier: HELIUM

Temp. prog: eto-100.tem

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:06:11 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.516

Ethylene Oxide

32.9390

35.0720 64.9295

64.9295 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A03.CHR (c:\peak359) Data file: 1SterCLT2019-1A03.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 External/Units 2.2560/0.216 0.0000/ Ambient H2O 60.4135/ppm **- 30.6480/0.500** External Units External Units Component Retention Area Area Component Retention 0.0000 Ambient H2O 0.350 238.0070

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

238.0070

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:11:03 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hairie. Looi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 08:11:03 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

60.4135

60.4135 ppm

2.2560

30.6480

32.9040

0.216 0.500

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterCLT2019-1A04.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterCLT2019-1A04.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.800 External/Units 128.000 -12.800 -12.800 Component 0.0000/ 47.1910/0.116 Dead Vol / Air 0.0000/ 2.2980/0.216 ead Vol / Air 0.0000/ Ambient H2O 59.1460/ppm 30.0050/0.500 External Units External Units Component Retention Area Retention Area Component 0.0000

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.116

0.350

47.1910

226.3160

273.5070

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:16:03 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab hame. Loo

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:16:03 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.216

0.500

Dead Vol / Air

Ethylene Oxide

0.0000

59.1460 ppm

2.2980

32.3030 59.1460

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A05.CHR (c:\peak359) Data file: 1SterCLT2019-1A05.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 -25.600 128.000 -12.800 xternal/Units Component 38.2860/0.166 0.0000/ Dead Vol / Air 2.2730/0.216 0.0000/ Ambient H2O 202 4340/0.333 58.7340/ppm × 29.7960/0.500 External Units Component Retention Area External Units Component Retention Area 0.0000 Dead Vol / Air 0.166 38.2860 0.0000 Dead Vol / Air 0.216 2.2730

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

0.866

202.4340

259.5030

18.7830

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:21:03 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. Los

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:21:03 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

29.7960

32.0690

58.7340 ppm

Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterCLT2019-1A06.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterCLT2019-1A06.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 128.000 -12.800 -12.800 0.0000/ Dead Vol / Air 32.9430/0.150 0.0000/ 2.3245/0.216 Dead Vol / Air 0.0000/ Ambient H2O 228 8720/0 333 58.7133/ppm × 29.7855/0.500 External Units Component Retention Area External Units Component Retention Area 0.0000 0.0000 Dead Vol / Air 0.150 32.9430 0.216 2.3245 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

228.8720

261.8150

0.0000

0.0000

Client ID: Run#1Aer

Analysis date: 12/09/2019 08:26:02 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. Loo

Ethylene Oxide

Client ID: Run#1Aer

Analysis date: 12/09/2019 08:26:02 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

29.7855

32.1100 58.7133

58.7133 ppm

Data file: 2SterCLT2019-1A07.CHR (c:\peak359) Data file: 1SterCLT2019-1A07.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 -12.800 External/Units [0.0000/ Component Dead Vol / Air 0.0000/ 2.2830/0.216 ead Vol/Air 0.0000/ Ambient H2O 56.8220/ppm 41.8750/0.700 0.0000/ External Units External Units Component Retention Area Retention Component Area 0.0000 0.016 46.3705 0.0000 Dead Vol / Air 0.216 2.2830 Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

28.8260

31.1090

0.500

56.8220 ppm

56.8220

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 12/09/2019 08:31:03

Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

189.2520

41.8750

277.4975

0.350

0.700

0.0000

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 08:31:03

Method: Direct Injection

Description: CHANNÉL 2 - PID

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A08.CHR (c:\peak359) Data file: 1SterCLT2019-1A08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000_ -12.800 -12.800 Component Dead Vol / Air 0.0000/ 2.1210/0.216 0.0000/ 230,3660/0.333 6.4435/ppm External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.016 38.8860 0.0000 0.0000 Dead Vol / Air 0.216 2.1210

56.4435 ppm

56.4435

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

230.3660

269.2520

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:36:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1Aer

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 08:36:06 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.483

28.6340

Data file: 2SterCLT2019-1A09.CHR (c:\peak359) Data file: 1SterCLT2019-1A09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units |0.0000/ -12.800 -12.800 Component Dead Vol / Air 35.4670/0.016 0.0000/ 2.1610/0.216 Ambient H2O 213,1940/0,333 > 29.0500/0.500 External Units Component Retention Area External Units Component Retention Area 0.0000 Dead Vol / Air 0.016 35.4670 0.0000 Dead Vol / Air 0.216 2.1610 0.0000 213.1940 Ambient H2O 0.333 57.2635 ppm

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

248.6610

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 08:41:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. Eco

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 12/09/2019 08:41:06 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

29.0500

31.2110 57.2635

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-1A10.CHR (c:\peak359) Data file: 1SterCLT2019-1A10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 5.0000/Units 0.0000/ 2.2710/0.233 221.0390/0.350 > 30.1605/0.516 59.4525/ppm External Units Component Retention Area External Units Component Retention Area Ambient H2O 0.350 221.0390 0.0000

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

221.0390

Client ID: Run#1Aer

Carrier: HELIUM

Analysis date: 12/09/2019 08:46:05

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#1Aer

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 08:46:05

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.233

0.516

0.0000

59.4525 ppm

2.2710

30.1605

32.4315 59.4525

Lab name: ECSI Client: Sterigenics - Charlotte Client ID: Run#1Aer Analysis date: 12/09/2019 08:51:22 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterCLT2019-1A11.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Column: 1% SP-1000, Carbopack B Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Client ID: Run#1Aer

Analysis date: 12/09/2019 08:51:22

Method: Direct Injection

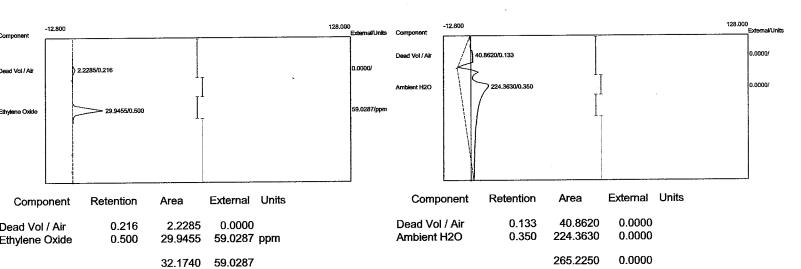
Description: CHANNEL 2 - PID

Lab Hairie. Looi

Client: Sterigenics - Charlotte

Data file: 2SterCLT2019-1A11.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Components: eto1-100.cpt Data file: 1SterCLT2019-1A12.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterCLT2019-1A12.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 0.0000/ 36.7390/0.166 0.0000/ 2.2365/0.216 Ambient H2O 59.2406/ppm External Units External Units Component Retention Area Component Retention Area 0.0000 Dead Vol / Air 0.166 36.7390 0.0000 Dead Vol / Air 0.216 2.2365

Ambient H2O

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

0.333

224.1980

260.9370

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 08:56:12 Method: Direct Injection

Lab name: ECSI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 08:56:12 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.483

Ethylene Oxide

30.0530

32.2895

59.2406 ppm

APPENDIX D

Run #2 Chromatograms – Backvent



Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B01.CHR (c:\peak359) Data file: 1SterCLT2019-2B01.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -12.800 128.000 -12.800 2.2130/0.216 0.0000/ Dead Vot / Air 0.0000/ 215.8155/0.333 Ambient H2O 31.2940/0.500 External Units Retention External Units Component Area Retention Area Component 0.0000 0.333 215.8155 2.2130 0.0000 Ambient H2O 0.216 Dead Vol / Air Ethylene Oxide 31.2940 61.6869 ppm 0.500

Client: Sterigenics - Charlotte

215.8155

0.0000

Client ID: Run#2BV

Analysis date: 12/09/2019 09:55:01 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hame. ECS

Client ID: Run#2BV

Analysis date: 12/09/2019 09:55:01 Method: Direct Injection

Client: Sterigenics - Charlotte

33.5070 61.6869

Data file: 2SterCLT2019-2B02.CHR (c:\peak359) Data file: 1SterCLT2019-2B02.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 128.000 -12.800 Component Dead Vol / Air 46.6520/0.033 0.0000/ 2.3310/0.233 0.0000/ 221.4925/0.366 Ambient H2O 60.9822/ppm Component Retention Area External Units External Units Component Retention Area Dead Vol / Air 0.033 46.6520 0.0000 0.0000 Dead Vol / Air 0.233 2.3310 0.0000 Ambient H2O 0.366 221.4925 0.516 30.9365 60.9822 ppm Ethylene Oxide

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

0.0000

268.1445

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 09:56:05 Method: Direct Injection

Lab name: ECSI

Client ID: Run#2BV Analysis date: 12/09/2019 09:56:05

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

33.2675 60.9822

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B03.CHR (c:\peak359) Data file: 1SterCLT2019-2B03.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Sample: Oxidizer Inlet Operator: D. Kremer 128.000 External/Units 0.0000/ 128,000 -12.800 Component Dead Vol / Air 6.0675/0.016 0.0000/ 211.8420/0.333 0.0000/ 61.4612/ppm 31,1795/0.500 Component Retention Area External Units Retention Area External Units Component 0.016 36.0675 0.0000 Dead Vol / Air Dead Vol / Air 0.216 2.2650 0.0000 Ambient H2O

61.4612 ppm

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

211.8420

247.9095

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 09:57:11 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 09:57:11 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

31.1795

33.4445 61.4612

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B04.CHR (c:\peak359) Data file: 1SterCLT2019-2B04.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 Component Dead Vol / Air 0.0000/ 2.2395/0.216 Ambient H2O 215.1335/0.333 60.3346/ppm External Units External Units Component Retention Area Retention Area Component 0.0000 37.5340 0.0000 Dead Vol / Air 0.016 0.216 2.2395 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

215.1335

252.6675

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 09:59:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hanne. Look

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 09:59:06 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

30.6080

32.8475 60.3346

0.500

60.3346 ppm

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B05.CHR (c:\peak359) Data file: 1SterCLT2019-2B05.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 _External/Units 128.000 -12.800 External/Units 0.0000/ 2.1935/0.216 0.0000/ 229.2100/0.350 60.5623/ppm - 30,7235/0,500 External Units Component Retention Area External Units Component Retention Area 0.0000 Ambient H2O 0.350 229.2100 0.0000 Dead Vol / Air 0.216 2.1935

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

229.2100

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:00:14 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. Ecoi

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:00:14 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

30.7235

32.9170 60.5623

60.5623 ppm

Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B06.CHR (c:\peak359) Data file: 1SterCLT2019-2B06.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 Evtomol/Units 10.0000/ -12.800 2.2725/0.233 Dead Vol / Air 0.0000/ Ambient H2O 60.7624/ppm → 30.8250/0.500 0.0000/ .1360/0.916

External Units

60.7624 ppm

0.0000

Component

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Retention

0.350

0.916

Area

213.7955

219.9315

6.1360

External Units

0.0000

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:01:23

Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab name. Loo

Component

Dead Vol / Air

Ethylene Oxide

Client ID: Run#2BV

Analysis date: 12/09/2019 10:01:23

Method: Direct Injection

Client: Sterigenics - Charlotte

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Retention

0.233

0.500

Area

2.2725

30.8250

33.0975 60.7624

Analysis date: 12/09/2019 10:03:57 Method: Direct Injection Description: CHANNEL 2 - PID Method: Direct Injection Description: CHANNÉL 1 - FID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B08.CHR (c:\peak359) Data file: 1SterCLT2019-2B08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12,800 128.000 -12.800 . Fvcmal/Units 10.0000/ External/Units unknown 37.1150/0.000 0.0000/ 2.1960/0.216 ead Vol / Air 0.0000/ 216.5790/0.333 59.4082/ppm ⊃ 30.1380/0.500 0.1675/0.833 0.0000/ External Units External Units Component Retention Area Retention Area Component 0.0000 0.333 216.5790 0.0000 Ambient H2O 2.1960 0.216 Dead Vol / Air 59.4082 ppm

Client: Sterigenics - Charlotte

0.0000

216.5790

Client ID: Run#2BV

Client: Sterigenics - Charlotte

30.1380

0.1675 32.5015 0.0000

59.4082

0.500

0.833

Analysis date: 12/09/2019 10:03:57

Client ID: Run#2BV

Ethylene Oxide

Acetaldehyde

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B07.CHR (c:\peak359) Data file: 1SterCLT2019-2B07.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 128,000 -12.800 External/Units |0.0000/ External/Units Component Dead Vol / Air 2.1860/0.216 Dead Vol / Air 0.0000/ 60.2814/ppm thylene Oxide External Units Component Retention Area External Units Retention Area Component 0.0000 0.016 43.5455 2.1860 0.0000 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

0.0000

225.5240

269.0695

0.350

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:02:34 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hame. Look

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:02:34 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.216

0.500

30.5810

32.7670

60.2814 ppm

60.2814

Dead Vol / Air

Ethylene Oxide

Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 2SterCLT2019-2B09.CHR (c:\peak359) Data file: 1SterCLT2019-2B09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128,000 -12.800 10.0000/Units 234.1530/0.350 60.9792/ppm 30.9350/0.500 Retention Area External Units Component Retention Area External Units Component Ambient H2O 0.350 234.1530 0.0000 0.0000 Dead Vol / Air 0.216 2.2180 30.9350 60.9792 ppm Ethylene Oxide 0.500 0.0000 234.1530

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:05:17 Method: Direct Injection

Lab name: ECSI

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:05:17 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

33.1530

Components: eto1-100.cpt Data file: 1SterCLT2019-2B10.CHR (c:\peak359) Sample: Oxidizer Inlet Data file: 2SterCLT2019-2B10.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 0.0000/ Dead Vol / Air 35.3020/0.150 2.1850/0.216 0.0000/ 217.5540/0.350 Ambient H2O 60.1040/ppm 30.4910/0.500 External Units External Units Component Retention Area Retention Area Component 35.3020 0.0000 0.0000 Dead Vol / Air 0.150 2.1850 0.216 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

0.0000

217.5540

252.8560

0.350

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 10:06:41

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hattie. LCOI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 10:06:41

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

30.4910

32.6760

60.1040 ppm

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2B11.CHR (c:\peak359) Data file: 1SterCLT2019-2B11.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 Component Dead Vol / Air 37.2605/0.016 2.1860/0.233 189.7570/0.350 69.0455/ppm lo oooo Retention Area External Units Component Retention Area External Units Component 0.016 37.2605 0.0000 Dead Vol / Air Dead Vol / Air 0.233 2.1860 0.0000 189.7570 0.0000 Ambient H2O 0.350 59.0455 ppm 0.516 29.9540 Ethylene Oxide

Acetaldehyde

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

0.0000

0.0000

1.1815

228.1990

0.933

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:07:44 Method: Direct Injection

Lab name: ECSI

Client ID: Run#2BV

Analysis date: 12/09/2019 10:07:44 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

32.1400

Temp. prog: eto-100.tem Components: eto2-100.cpt
Data file: 2SterCLT2019-2B12.CHR (c:\peak359) Components: eto1-100.cpt Data file: 1SterCLT2019-2B12.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 -12.800 50.0000/Units 2.1270/0.216 0.0000/ 59.1716/ppm External Units Component Retention Area Retention Area External Units Component 0.333 215.6865 0.0000 Ambient H2O Dead Vol / Air 0.216 2.1270 0.0000

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

215.6865

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:08:47 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2BV

Carrier: HELIUM

Analysis date: 12/09/2019 10:08:47 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

30.0180

32.1450 59.1716

59.1716 ppm

APPENDIX E

Run #2 Chromatograms – Aeration



Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A01.CHR (c:\peak359) Data file: 1SterCLT2019-2A01.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 -12.800 Component Dead Vol / Air 39.7050/0.016 0.0000/ 2.1780/0.200 Ambient H2O 230.1175/0.333 0.0000/ 29.1715/0.483 57.5030/ppm 0.0000/ 0.1160/0.866 Component Retention Area External Units Area External Units Retention Component

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.016

0.333

39.7050

230.1175

269.8225

0.0000

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:11:20 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hattle. LCOI

Client ID: Run#2Aer

Carrier: HELIUM

Analysis date: 12/09/2019 10:11:20 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.200

0.483

0.866

Dead Vol / Air

Ethylene Oxide

Acetaldehyde

2.1780

29.1715

0.1160

31.4655

0.0000

0.0000

57.5030

57.5030 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A02.CHR (c:\peak359) Data file: 1SterCLT2019-2A02.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128,000 -12,800 -12.800 39.0505/0.016 0.0000/ 0.0000/ 217.6650/0.350 59,9384/ppm 30.4070/0.500 External Units Component Retention Area Retention Area External Units Component 0.016 39.0505 0.0000 Dead Vol / Air 0.216 2.2860 0.0000 Dead Vol / Air

Ambient H2O

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.350

217.6650

256.7155

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:16:18 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: EUSI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:16:18 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

Ethylene Oxide

30.4070

32.6930

59.9384 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A03.CHR (c:\peak359) Data file: 1SterCLT2019-2A03.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 128,000 -12.800 51.7780/0.016 0.0000/ 2.1325/0.216 0.0000/ 220.8700/0.350 59.1391/ppm > 30.0015/0.483 0.0000/ 26.3995/0.766 External Units Component Retention Area Retention Area External Units Component 0.016 51.7780 0.0000 Dead Vol / Air 0.216 2.1325 0.0000 Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

220.8700

26.3995

299.0475

0.0000

0.0000

0.0000

0.350

0.766

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:21:10

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:21:10

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.483

Ethylene Oxide

30.0015

32.1340

59.1391 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A04.CHR (c:\peak359) Data file: 1SterCLT2019-2A04.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -25.600 128.000 -12.800 External/Units unknown 0.0000/ 2.1910/0.216 0.0000/ 59.5659/ppm 30,2180/0.500 External Units Retention External Units Component Area Retention Area Component 225.8260 0.0000 0.0000 Ambient H2O 0.350 0.216 2.1910 Dead Vol / Air

59.5659 ppm

59.5659

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

225.8260

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:26:30 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab Haille. Looi

Client ID: Run#2Aer Analysis date: 12/09/2019 10:26:30

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

30.2180

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A05.CHR (c:\peak359) Data file: 1SterCLT2019-2A05.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -25.600 -12.800 0.0000/ 2.2980/0.216 0.0000/ External Units Retention External Units Component Area Retention Area Component 0.0000 0.350 228.8570 2.2980 0.0000 Ambient H2O 0.216 Dead Vol / Air

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

228.8570

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:31:18

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Haitle. Looi

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 10:31:18

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.9070

32.2050

0.500

58.9528 ppm

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A06.CHR (c:\peak359) Data file: 1SterCLT2019-2A06.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 256.000 128.000 -25.600 -12.800 External/Units Component Dead Vol / Air 40.7310/0.016 0.0000/ 2.1740/0.216 ead Vol/Alt 227.7930/0.350 0.0000/ Ambient H2O 59.5481/ppm - 30,2090/0.500 External Units External Units Component Retention Area Retention Area Component 0.0000 0.0000 Dead Vol / Air 0.016 40.7310 0.216 2.1740 Dead Vol / Air

Ambient H2O

59.5481 ppm

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

0.350

227.7930

268.5240

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Analysis date: 12/09/2019 10:36:05 Method: Direct Injection

Lab Haille. Looi

Client ID: Run#2Aer

Carrier: HELIUM

Ethylene Oxide

Analysis date: 12/09/2019 10:36:05 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

30.2090

32.3830 59.5481

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterCLT2019-2A07.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer Data file: 2SterCLT2019-2A07.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer 256.000 ---------------------/Units 128.000 -25.600 -12,800 2.1975/0.216 0.0000/ Ambient H2O 58.9824/ppm > 29.9220/0.500 External Units External Units Component Retention Area Retention Area Component 0.0000 0.350 227.1550 2.1975 0.0000 Ambient H2O 0.216 Dead Vol / Air

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.9220

32.1195 58.9824

0.500

58.9824 ppm

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 10:41:45

Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

227.1550

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:41:45

Method: Direct Injection

Description: CHANNEL 2 - PID

Data file: 2SterCLT2019-2A08.CHR (c:\peak359) Data file: 1SterCLT2019-2A08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 -25.600 128.000 -12.800 Component Dead Vol / Air 0.0000 0.0000/ 149.1220/0.333 58.2718/ppm 29.5615/0.500 12.6240/0.716 0.0000/ External Units Component Retention Area External Units Component Retention Area 0.0000 Dead Vol / Air 0.016 36.3620 0.0000 Dead Vol / Air 0.216 2.2270 149.1220 0.0000 Ambient H2O 0.333 58.2718 ppm Ethylene Oxide 0.500 29.5615 0.0000 0.716 12.6240 Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

198.1080

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 10:46:04 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 12/09/2019 10:46:04 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

31.7885

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-2A09.CHR (c:\peak359) Data file: 1SterCLT2019-2A09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 128.000 -12.800 39.0955/0.150 0.0000/ Dead Vol / Air 0.0000/ 2.2575/0.216 0.0000/ 57.8095/ppm 29.3270/0.500 0.0000/ Component Retention Area External Units External Units Component Retention Area

Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.150

0.350

0.883

39.0955

196.4885

249.4235

13.8395

0.0000

0.0000

0.0000

0.0000

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 12/09/2019 10:51:22 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 10:51:22 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.216

0.500

0.0000

57.8095 ppm

2.2575

29.3270

31.5845 57.8095

Components: eto1-100.cpt Data file: 2SterCLT2019-2A10.CHR (c:\peak359) Data file: 1SterCLT2019-2A10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units 256.000 -25.600 -12.800 0.0000/Units 0.0000/ 2.3130/0.216 29.5900/0.500 External Units Component Retention Area External Units Component Retention Area Ambient H2O 0.350 220.5430 0.0000 0.0000 Dead Vol / Air 0.216 2.3130

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

220.5430

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 10:56:47

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 10:56:47

Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.5900

31.9030

0.500

58.3280 ppm

Components: eto1-100.cpt Data file: 2SterCLT2019-2A11.CHR (c:\peak359) Data file: 1SterCLT2019-2A11.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 -25.600 -12.800 0.0000/Units 0.0000/ 2,2210/0,216 0.0000/ Ambient H2O 58.0618/ppm - 29.4550/0.500 0.0000/ External Units Component Retention Area External Units Component Retention Area 0.0000 Ambient H2O 0.333 201.3890 0.0000 Dead Vol / Air 0.216 2.2210 9.2510 0.0000 Acetaldehyde 0.866

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

210.6400

0.0000

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:01:08 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. Eco

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 11:01:08 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

29.4550

31.6760 58.0618

58.0618 ppm

Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 2SterCLT2019-2A12.CHR (c:\peak359) Data file: 1SterCLT2019-2A12.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -25.600 -12.800 0.0000/ 59.1204/ppm 29,9920/0.500 External Units Component Retention Area External Units Component Retention Area 0.0000 Ambient H2O 0.333 220.6790 Dead Vol / Air 0.0000 0.216 2.2945 29.9920 59.1204 ppm Ethylene Oxide 0.500 0.0000 220.6790

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#2Aer

Carrier: HELIUM

Analysis date: 12/09/2019 11:06:35 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab name: EUSI

Client ID: Run#2Aer

Carrier: HELIUM

Analysis date: 12/09/2019 11:06:35 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

32.2865

APPENDIX F

Run #3 Chromatograms – Backvent



Components: eto1-100.cpt Data file: 2SterCLT2019-3B01.CHR (c:\peak359) Data file: 1SterCLT2019-3B01.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -12.800 128,000 128.000 -12.800 0.0000/ 2.3095/0.216 0.0000/ 213.5880/0.350 57.6272/ppm 29.2345/0.500 0.0000/ External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.016 41.5365 0.0000 0.0000 Dead Vol / Air 0.216 2.3095

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.350

0.833

213.5880

276.7665

21.6420

0.0000

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:19:39 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. Eco

Client ID: Run#3BV Analysis date: 12/09/2019 11:19:39

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

29.2345

31.5440 57.6272

57.6272 ppm

Components: eto1-100.cpt Data file: 1SterCLT2019-3B02.CHR (c:\peak359) Sample: Oxidizer Inlet Data file: 2SterCLT2019-3B02.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -12.800 128.000 -25.600 0.0000/Units 0.0000/ 2.3230/0.216 0.0000/ 175.7782/ppm 89.1730/0.500 0.0000/ External Units Component Retention Area External Units Component Retention Area Ambient H2O 0.350 171.6935 0.0000 0.0000 2.3230 Dead Vol / Air 0.216

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.800

39.8060

211.4995

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:20:43

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Haille. Looi

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 12/09/2019 11:20:43

Method: Direct Injection

Description: CHANNEL 1 - FID

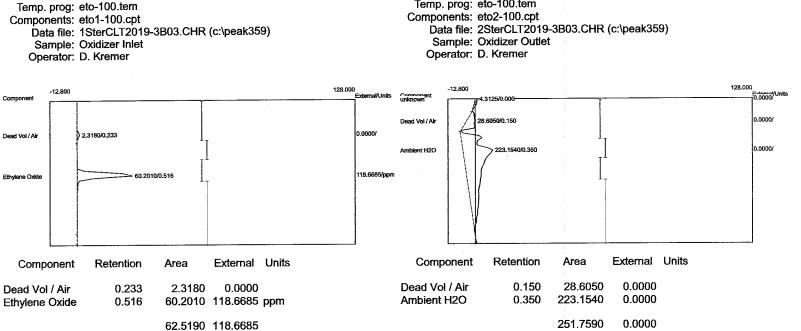
Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

89.1730 175.7782 ppm

91.4960 175.7782



Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 11:21:49 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Hattle. Loci

Client ID: Run#3BV

Carrier: HELIUM

Analysis date: 12/09/2019 11:21:49 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Data file: 2SterCLT2019-3B04.CHR (c:\peak359) Data file: 1SterCLT2019-3B04.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 40.4130/0.016 0.0000/ 2.2995/0.216 0.0000/ 215.0810/0.350 94.9687/ppm 0.0000/ Component Retention Area External Units External Units Component Retention Area 0.016 40.4130 0.0000 0.0000 Dead Vol / Air Dead Vol / Air 0.216 2.2995 0.350 215.0810 0.0000 48.1780 94.9687 ppm Ambient H2O Ethylene Oxide 0.500 0.0000 Acetaldehyde 0.866 12.4490

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

267.9430

Client ID: Run#3BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:22:55 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. ECS

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 12/09/2019 11:22:55

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

50.4775

Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 2SterCLT2019-3B05.CHR (c:\peak359) Data file: 1SterCLT2019-3B05.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 128.000 -12.800 External/Units Component External/Unit: .0000/ 2.1740/0.216 0.0000/ Dead Vol / Air 218.5820/0.333 91.4373/ppm 0.0000/ External Units Component Retention Area External Units Component Retention Area 0.0000 Dead Vol / Air 0.100 38.6410 0.0000 Dead Vol / Air 0.216 2.1740

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.500

46.3865

48.5605

91.4373 ppm

91.4373

Client ID: Run#3BV

Carrier: HELIUM

Ethylene Oxide

Analysis date: 12/09/2019 11:24:02

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.333

0.916

218.5820

264.3895

7.1665

0.0000

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Analysis date: 12/09/2019 11:24:02

Method: Direct Injection

Description: CHANNEL 2 - PID

Data file: 1SterCLT2019-3B06.CHR (c:\peak359)
Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -12.800 128.000 128.000 -12.800 Evternal/Units 0.0000/ 2.4220/0.216 0.0000/ 226.8800/0.350 90.8942/ppn 46.1110/0.500 0.0000/ 15.1830/0.866 External Units External Units Component Retention Area Component Retention Area 226.8800 0.0000 0.350 0.0000 Ambient H2O Dead Vol / Air 0.216 2.4220 0.866 15.1830 0.0000 0.500 46.1110 90.8942 ppm Acetaldehyde Ethylene Oxide

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Data file: 2SterCLT2019-3B06.CHR (c:\peak359)

242.0630

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:25:07 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. ECSI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

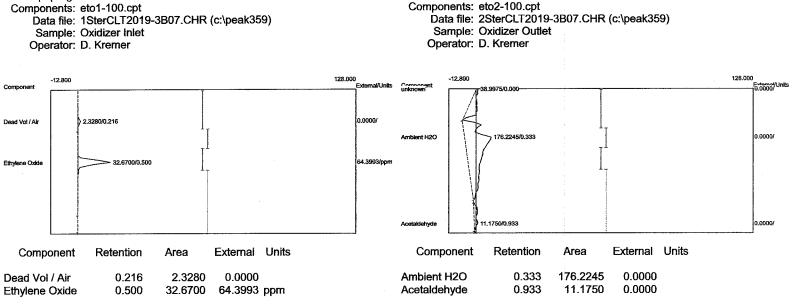
Analysis date: 12/09/2019 11:25:07 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

48.5330



Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

187.3995

Client ID: Run#3BV

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:26:14

Method: Direct Injection Description: CHANNÉL 2 - PID

Lab Hallie. LCOI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 11:26:14

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

64.3993

Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-3B08.CHR (c:\peak359) Data file: 1SterCLT2019-3B08.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units -12.800 128.000 -12.800 5.00000/U 2.1360/0.200 Dead Vol / Air 0.0000/ 0.0000/ Ethylene Oxide × 29.7150/0.483 External Units Component Retention External Units Component Retention Area Area 0.200 0.0000 Ambient H2O 0.333 249.0130 0.0000 2.1360 Dead Vol / Air 0.483 29.7150 58.5744 ppm Ethylene Oxide 249.0130 0.0000

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#3BV

Analysis date: 12/09/2019 11:27:36 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

31.8510 58.5744

Client ID: Run#3BV

Analysis date: 12/09/2019 11:27:36 Method: Direct Injection Description: CHANNEL 1 - FID

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-3B09.CHR (c:\peak359) Data file: 1SterCLT2019-3B09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 -12.800 128,000 -12.800 Component 33.7175/0.100 0.0000/ Dead Vol / Air 2.2105/0.216 0.0000/ Dead Vol / Air 0.0000/ Ambient H2O 116,7560/0,333 - 29.7910/0.500 58.7242/ppm 0.0000/ External Units Component Retention Area Component Retention Area External Units

Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.216

0.500

2.2105

29.7910

32.0015

0.0000

58.7242

58.7242 ppm

Client ID: Run#3BV

Carrier: HELIUM

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 11:28:53 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.100

0.333

0.700

33.7175

116.7560

26.8770

177.3505

0.0000

0.0000

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 11:28:53 Method: Direct Injection Description: CHANNEL 2 - PID

Components: eto1-100.cpt Data file: 2SterCLT2019-3B10.CHR (c:\peak359) Data file: 1SterCLT2019-3B10.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 -12.800 Component Dead Vol / Air 42.6020/0.016 2.2270/0.216 Dead Vol / Air Ambient H2O 28 8030/0 483 0.1030/0.883 External Units Component Retention Area External Units Component Retention Area 0.0000 Dead Vol / Air 0.016 42,6020 0.0000 Dead Vol / Air 0.216 2.2270 56.7766 ppm 0.0000 0.333 179.2890 0.483 28.8030 Ambient H2O Ethylene Oxide

0.0000

56.7766

0.1030

31.1330

Acetaldehyde

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

0.866

10.8460

232.7370

0.0000

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:30:07 Method: Direct Injection

Lay Hallie. ECO

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Acetaldehyde

Analysis date: 12/09/2019 11:30:07 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt Temp. prog: eto-100.tem Components: eto1-100.cpt Data file: 2SterCLT2019-3B11.CHR (c:\peak359) Data file: 1SterCLT2019-3B11.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 128.000 -12.800 Component Dead Vol / Air 0.0000/ 2.1315/0.216 Dead Vol / Air 0.0000/ 0.0000/ External Units

Client: Sterigenics - Charlotte

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Retention

0.016

0.333

0.650

Component

Dead Vol / Air

Ambient H2O

Acetaldehyde

Area

36.9380

124.6790

171.2390

9.6220

0.0000

0.0000

0.0000

0.0000

Client ID: Run#3BV

Analysis date: 12/09/2019 11:31:22 Method: Direct Injection

Lab name: EUSI

Client ID: Run#3BV

Analysis date: 12/09/2019 11:31:22 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Retention

0.216

0.500

Component

Dead Vol / Air

Ethylene Oxide

Area

2.1315

28.5960

30.7275

External Units

56.3686 ppm

0.0000

Client: Sterigenics - Charlotte
Client ID: Run#3BV
Analysis date: 12/09/2019 11:33:31
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt

Data file: 1SterCLT2019-3B12.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Client: Sterigenics - Charlotte Client ID: Run#3BV

Analysis date: 12/09/2019 11:33:31 Method: Direct Injection Description: CHANNEL 2 - PID

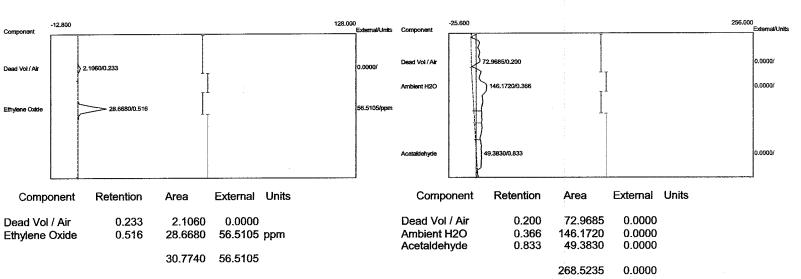
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt

Lab hame. Looi

Data file: 2SterCLT2019-3B12.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



APPENDIX G

Run #3 Chromatograms – Aeration



Data file: 2SterCLT2019-3A01.CHR (c:\peak359) Data file: 1SterCLT2019-3A01.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 256,000 128.000 -25.600 -12.800 External/Units Component 50.4860/0.183 0.0000/ Dead Vol / Air Dead Vol / Air 2.2770/0.233 0.0000/ 0.0000/ 165.9000/0.350 Ambient H2O 57.0309/ppm 28.9320/0.516 12.8570/0.766 0.0000/ External Units External Units Component Retention Area Component Retention Area 0.0000 0.233 2.2770 0.0000 Dead Vol / Air 0.183 50.4860 Dead Vol / Air 0.0000

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.350

0.766

165.9000

42.8570

259.2430

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 11:36:19 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab Harrie, Looi

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 12/09/2019 11:36:19 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.516

Ethylene Oxide

28.9320

31.2090

57.0309 ppm

Data file: 2SterCLT2019-3A02.CHR (c:\peak359) Data file: 1SterCLT2019-3A02.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 256.000 128.000 -25.600 -12.800 External/Units 2.1445/0.233 0.0080/ Dead Vol / Air 0.0000/ Ambient H2O 55.4194/ppm 28.1145/0.516 8.2700/0.733 0.0000/ External Units External Units Component Retention Area Retention Area Component 0.0000 165.8810 2.1445 0.0000 Ambient H2O 0.350 0.233 Dead Vol / Air 0.0000

55.4194 ppm

55.4194

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

8.2700

174.1510

0.0000

0.733

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:41:34

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Harrie. Loo

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 12/09/2019 11:41:34 Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.516

28.1145

Data file: 2SterCLT2019-3A03.CHR (c:\peak359) Data file: 1SterCLT2019-3A03.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -25.600 256,000 128.000 -12.800 External/Units 0.0000/ 41.4530/0.083 Dead Vol / Air 2.1610/0.200 .0000/ Dead Vol / Air 0.0000/ 204.8790/0.316 Ambient H2O 55 6087/ppm 0.0000/ Component Retention Area External Units External Units Component Retention Area 0.083 41.4530 0.0000 Dead Vol / Air 0.0000 Dead Vol / Air 0.200 2.1610 0.0000 Ambient H2O 0.316 204.8790 28.2105 55.6087 ppm Ethylene Oxide 0.483 0.0000 Acetaldehyde 32.0290 0.716

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

278.3610

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 12/09/2019 11:46:10

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Harrie. ECO

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 12/09/2019 11:46:10

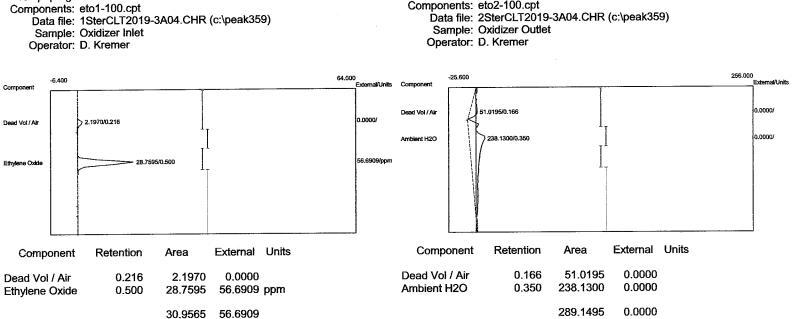
Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

30.3715 55.6087



Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:51:08 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. Look

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 11:51:08 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Data file: 2SterCLT2019-3A05.CHR (c:\peak359) Data file: 1SterCLT2019-3A05.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 64,000 -12.800 45.8075/0.133 0.0000/ Dead Vol / Ali .0000/ Dead Vol / Air 2.2080/0.216 232.9250/0.350 0.0000/ 28 4345/0 500 Retention Area External Units External Units Component Component Retention Area 0.133 45.8075 0.0000 Dead Vol / Air Dead Vol / Air 0.0000 0.216 2.2080 0.0000 Ambient H2O 0.350 232.9250 28.4345 56.0502 ppm Ethylene Oxide 0.500

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

278.7325

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 11:56:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name. Econ

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 12/09/2019 11:56:06 Method: Direct Injection

Description: CHANNÉL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

30.6425

Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterCLT2019-3A06.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterCLT2019-3A06.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -12.800 128,000 -6.400 ternal/Units Component External/Unit 36.8380/0.183 Dead Vol / Air 0.0000/ 2.2530/0.216 Dead Vol / Air Ambient H2O 197,5745/0,333 .0000/ 55.7358/ppm 28.2750/0.500 External Units External Units Component Retention Area Retention Component Area

Dead Vol / Air

Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.183

0.333

0.933

36.8380

4.5730

197.5745

238.9855

0.0000

0.0000

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 12/09/2019 12:01:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. Loo

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 12/09/2019 12:01:06 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

55.7358

55.7358 ppm

2.2530

28.2750

30.5280

0.216

Data file: 2SterCLT2019-3A07.CHR (c:\peak359) Data file: 1SterCLT2019-3A07.CHR (c:\peak359)
Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128.000 -12,800 -6,400 -0 3275/0 800— 28.3380/0.033 0.0000/ Dead Vol / Air 2.1755/0.216 189.5770/0.333 0.0000/ nt H2O 27.7320/0.500 0.0000/ 12.6210/0.800 External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.033 28.3380 0.0000 0.0000 2.1755 Dead Vol / Air 0.216 0.0000 189.5770 Ambient H2O 0.333 Ethylene Oxide 0.500 27.7320 54.6655 ppm 0.800 12.6210 0.0000

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

230.5360

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 12:06:38 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab Hame. Ecol

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

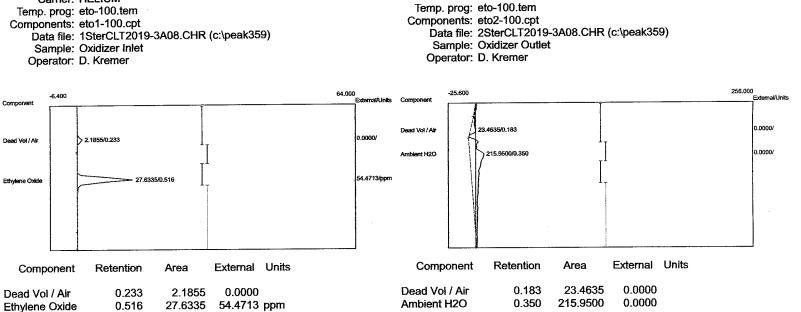
Analysis date: 12/09/2019 12:06:38 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.9075 54.6655



Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

239.4135

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 12/09/2019 12:11:06 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 12/09/2019 12:11:06 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.8190 54.4713

Data file: 2SterCLT2019-3A09.CHR (c:\peak359) Data file: 1SterCLT2019-3A09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 External/Units -12.800 -6.400 Component Dead Vol / Air Dead Vol / Air 2.2550/0.216 0.0000/ Ambient H2O - 27.7410/0.500 0.0000/ External Units External Units Component Retention Area Component Retention Area 0.0000 Dead Vol / Air 0.033 42.5980 0.0000 2.2550 Dead Vol / Air 0.216 0.0000 164.1960 54.6832 ppm Ambient H2O 0.350 27.7410 Ethylene Oxide 0.500

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.683

39.3520

246.1460

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 12:16:06 Method: Direct Injection

Description: CHANNÉL 2 - PID

Lab hame. Los

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 12/09/2019 12:16:06 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.9960

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterCLT2019-3A10.CHR (c:\peak359) Data file: 1SterCLT2019-3A10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 128.000 64.000 -12.800 -6.400 External/Unit Component 0.0000/ 43,4120/0.183 0.0000/ 2.2900/0.216 Dead Vol / Air 0.0000/ Ambient H2O 55.1632/ppm Ethylene Oxide 0.0000/ 2.2790/0.916 External Units Retention Area Component Retention Area External Units Component 43.4120 0.0000 0.183 Dead Vol / Air Dead Vol / Air 0.216 2,2900 0.0000 0.0000 0.333 214.5260 Ambient H2O

Acetaldehyde

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

0.0000

0.0000

2.2790

260.2170

0.916

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 12:21:11

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 12:21:11

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

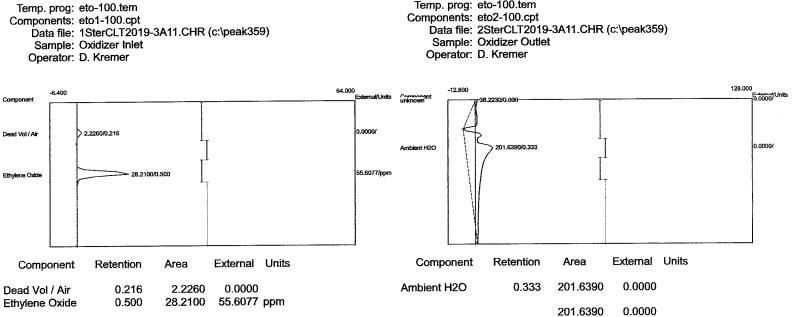
0.500

Ethylene Oxide

27.9845

30.2745 55.1632

55.1632 ppm



Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 12/09/2019 12:26:13

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab name: ECSI

Client ID: Run#3Aer

Carrier: HELIUM

Analysis date: 12/09/2019 12:26:13

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

30.4360

Data file: 2SterCLT2019-3A12.CHR (c:\peak359) Data file: 1SterCLT2019-3A12.CHR (c:\peak359)
Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 128,000 -12.800 64.000 -6.400 Component Dead Vol / Air 0.00007 2.1420/0.216 Dead Vol/Alm 242.6460/0.333 0.0000/ 27.7150/0.483 54.6319/ppm Component Retention Area External Units External Units Component Retention Area Dead Vol / Air 0.016 40.2620 0.0000 0.0000 2.1420 Dead Vol / Air 0.216 0.0000 54.6319 ppm Ambient H2O 0.333 242.6460 0.483 27.7150 Ethylene Oxide

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

282.9080

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 12/09/2019 12:31:14 Method: Direct Injection

Description: CHANNEL 2 - PID

Lab hame. Loo

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 12/09/2019 12:31:14 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Charlotte

Column: 1% SP-1000, Carbopack B

29.8570 54.6319

APPENDIX H

Field Data and Calculation Worksheets



LOD Calculation EtO Sterigenics - Charlotte, NC 12/9/2019

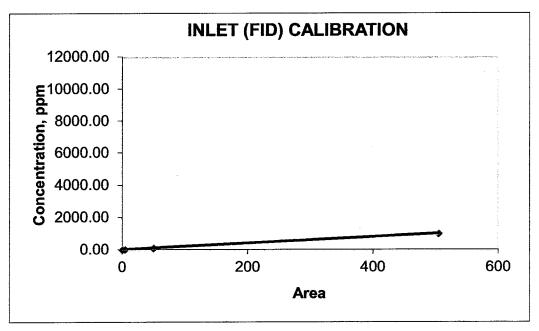
	-		Y =	A		+	m	х
Outlet			ppm =	-3.07E-	-02	+	0.643955	x area
Lowest Cal G	as							
	Area	Calc ppi	n		LOD	=	A+3s	
	1.89	1.186	ppm		LOD	=	0.042	ppm
	1.89	1.186	ppm					
	1.88	1.180	ppm					
AVG		1.184	ppm					
Std Dev		0.004	ppm					
				1/2 LO	D	==	0.021	ppm

·				1/2 LOD	=	0.018	8 ppm
Std Dev		0.007	ppm				
AVG		1.221	ppm				
	0.611	1.223	ppm				
	0.613	1.227	ppm				
	0.606	1.213	ppm	LO	D = 0	.036	ppm
	Area	Calc ppi	n	LO	DD = A	\+3s	
Lowest Cal G	as						
Inlet			ppm =	0.01	+	1.98	x area
	_		Y =	Α	+	m	х

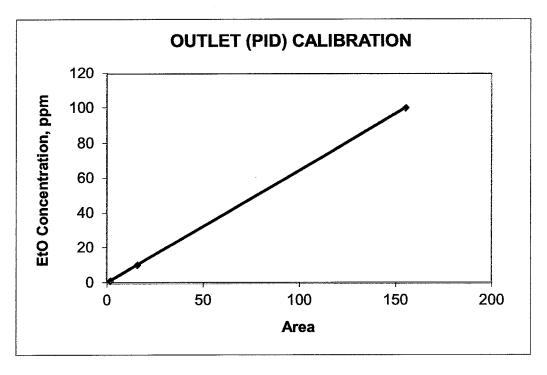
EtO Calibrations

Site: Sterigenics - Charlotte, NC

Date: 12/9/2019



Slope 1.98 Intercept 0.01



Slope 0.644 Intercept -0.0307

EtO Calibrations

Site:

Sterigenics - Charlotte, NC

Date:

12/9/2019

INLET - FID

ppm	0	1.18	10.2	100	1,000	10,080
Area 1	0	0.606	5.10	50.8	505	
Area 2	0	0.613	5.12	50.1	507	
Area 3	0	0.611	5.13	50.7	504	
AVG.	0	0.6100	5.117	50.53	505.3	

	AUDIT DIRECT	AUDIT BIAS
	52.0	52.0
	READS	READS
	51.5	52.1
ev.	-1.0%	0.2%

OUTLET - PID

ppm	0	1.18	10.2	100
Area 1	0	1.89	16.0	155
Area 2	0	1.89	15.9	156
Area 3	0	1.88	15.9	155
AVG.	0	1.887	15.93	155.3

	AUDIT DIRECT	AUDIT BIAS
	52.0	52.0
	READS	READS
	51.4	51.3
Dev.	-1.2%	-1.3%

]		
	PPM	READS	Dev.
INLET			#DIV/0!
OUTLET			#DIV/0!

	PPM	READS	Dev.
INLET	100	100.5	0.5%
OUTLET	1.18	1.19	0.8%

APPENDIX I

Gas Certifications







Praxair Distribution, Inc. ISO 9001 Registered 37256 Highway 30 Geismar, LA 70734 Tel: 225-677-7700 Fax: 225-673-3531

Filling Method: Gravimetric

Customer & Order Information:

PRAXAIR PKG SANTA ANA CA HPS 1545 E EDINGER AVE, SANTA ANA, CA 92705

Praxair Order Number: 70905412

Certificate Issuance Date:

3/15/2019

Certification Date: 3/15/2019 Lot Number: 70340 9067 8D Part Number: NI EO1MP-A3

DocNumber: 61840 Expiration Date: 3/14/2021

CERTIFICATE OF ANALYSIS

Primary Standard

	Requested	Certified		
	Concentration	Concentration	Analytical	Analytical
Component	(Molar)	(Molar)	Reference	Uncertainty
Ethylene oxide	1 ppm	1.18 ppm	1	± 0.1 ppm
Nitrogen	Balance	Balance		

Fill Date: 3/8/2019

Analysis Date: 3/14/2019

Cylinder Style: A3

Cylinder Pressure @ 70 F: 2000 psig Cylinder Volume: 28.2 ft3

Valve Outlet Connection: CGA 350 Cylinder Number(s): EA0023418

> waras Analyst: Ronnie Popularas

QA Reviewer: Anthony

Key to Analytical Techniques:

Reference **Analytical Instrument - Analytical Principle**

Hewlett-Packard 6890 - Gas Chromatography with FID

The gas calibration cylinder standard prepared by Praxair Distribution, Inc. is considered a certified standard. It is prepared by gravimetric, volumetric, or partial pressure techniques. The calibration standard provided is certified against. Praxair Distribution, Inc. Reference Materials which are either prepared by weights traceable to the National Institute of Standards and Technology (NIST), Measurement Canada, or by using NIST Standard Reference Materials where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by volume (e.g., ppmv) unless otherwise noted. Analytical uncertanity is expressed as a Relative % unless otherwise noted.

The information contained herein has been prepared at your request by personnel within Praxair Distribution, Inc.. While we believe the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Praxair Distribution, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.





Praxair Distribution. Inc. ISO 9001 Registered 37256 Highway 30 Geismar, LA 70734 Tel: 225-677-7700 Fax: 225-673-3531

Customer & Order Information:

PRAXAIR PKG SANTA ANA CA HPS 1545 E EDINGER AVE,

SANTA ANA, CA 92705

Praxair Order Number: 70905412

Certificate Issuance Date:

3/15/2019

Certification Date: 3/15/2019 Lot Number: 70340 9067 8E Part Number: NI EO10MP-A3

DocNumber: 61842 Expiration Date: 3/14/2021

CERTIFICATE OF ANALYSIS

Primary Standard

Component	Requested Concentration (Molar)	Certified Concentration (Molar)		Analytical Uncertainty
Ethylene oxide	10 ppm	10.2 ppm	1	±1%
Nitrogen	Balance	Balance		

Cylinder Style: A3

Cylinder Pressure @ 70 F: 2000 psig

Cylinder Volume: 28.3 ft3

Valve Outlet Connection: CGA 350 Cylinder Number(s): EA0022418 Fill Date: 3/8/2019

Analysis Date: 3/14/2019

Filling Method: Gravimetric

QA Reviewer: Anthony

Key to Analytical Techniques:

Reference **Analytical Instrument - Analytical Principle**

Hewlett-Packard 6890 - Gas Chromatography with FID

The gas calibration cylinder standard prepared by Praxair Distribution, Inc. is considered a certified standard. It is prepared by gravimetric, volumetric, or partial pressure techniques. The calibration standard provided is certified against Praxair Distribution, Inc. Reference Materials which are either prepared by weights traceable to the National Institute of Standards and Technology (NIST), Measurement Canada, or by using NIST Standard Reference Materials where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by volume (e.g., ppmv) unless otherwise noted. Analytical uncertanity is expressed as a Relative % unless otherwise noted.

IMPORTANT

The information contained herein has been prepared at your request by personnel within Praxair Distribution, Inc.. While we believe the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Praxair Distribution, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.





Praxair Distribution. Inc. ISO 9001 Registered 37256 Highway 30 Geismar, LA 70734 Tel: 225-677-7700

Fax: 225-673-3531

Certificate Issuance Date:

5/6/2019

PRAXAIR PKG SANTA ANA CA HPS

1545 E EDINGER AVE, SANTA ANA, CA 92705

Praxair Order Number: 70953858 Customer PO Number: 78936543

Customer & Order Information:

Certification Date: 5/6/2019

Lot Number: 70340 9119 1F Part Number: NI EO100P-A3

DocNumber: 71177 Expiration Date: 4/30/2021

CERTIFICATE OF ANALYSIS

Primary Standard

Component	Requested Concentration (Molar)	Certified Concentration (Molar)		Analytical Uncertainty
Ethylene oxide	100 ppm	100 ppm	1	±1%
Nitrogen	Balance	Balance		

Analysis Date: 4/30/2019

Cylinder Style: A3

Fill Date: 4/29/2019

Filling Method: Gravimetric

Cylinder Pressure @ 70 F: 2000 psig

Cylinder Volume: 28.7 ft3 Valve Outlet Connection: CGA 350 Cylinder Number(s): EA0023428

Analyst: Ronnie Popularas

QA Reviewer: Æ

Key to Analytical Techniques:

Reference Analytical Instrument - Analytical Principle

Hewlett-Packard 6890 - Gas Chromatography with FID

The gas calibration cylinder standard prepared by Praxair Distribution, Inc. is considered a certified standard. It is prepared by gravimetric, volumetric, or partial pressure techniques. The calibration standard provided is certified against Praxair Distribution, Inc. Reference Materials which are either prepared by weights traceable to the National Institute of Standards and Technology (NIST), Measurement Canada, or by using NIST Standard Reference Materials where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by volume (e.g., ppmv) unless otherwise noted. Analytical uncertanity is expressed as a Relative % unless otherwise noted.

IMPORTANT
The information contained herein has been prepared at your request by personnel within Praxair Distribution, Inc.. While we believe the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Praxair Distribution, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-005 Item No.: 02020001340TCL P.O. No.: VBL - D. KREMER

Cylinder Number: CLM002810 Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE **NITROGEN**

Concentration (Moles)

1,000.

PPM **BALANCE** Accuracy (+/-%)

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

DATE: <u>4-20-18</u>

SPECIFICATIONS Component Name	Reque Concent (Mol	tration	Certifi Concent (Mol	ration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	1,000.	PPM	1,000.	PPM	.0	5.00	
NITROGEN	•	BAL	•	BAL			

TRACEABILITY

Traceable To Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

1200 PSIG Pressure:

Valve Connection: CGA 350

Expiration Date: 20Apr2020

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS

CERTIFIED WORKING CLASS

Single-Certified Calibration Standard



00 CAJON BLVD., SAN BERNARDINO, CA 92411

Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-006 Item No.: 02020001340TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CLM005787

Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

10,080.

PPM

BALANCE

(+/-%)

Accuracy

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

P. M. Cully

DATE: 4-20-18

Page 1 of 2

SPECIFICATIONS Component Name	Requested Concentration (Moles)		Certified Concentration (Moles)		Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	10,000.	PPM	10,080.	PPM	.8	5.00	
MITTIPOCENT		BAT.		· BAT			

TRACEABILITY

Traceable To

Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: Expiration Date: 20Apr2020

700 PSIG

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

COMMENTS



CERTIFICATE OF ANALYSIS

Customer Name:

Environmental Compliance Specialists, Inc

Stock / Analyzer Tag #:

A006-1040-50PNC

Customer Reference:

Verbal Dan 124691

MESA Reference: Date of Certification:

April 17, 2019

Recommended Shelf Life:

April 17
2 Years

Cylinder Number: Product Class

CAL-4448

Certified Standard 28 CF @ 2000 PSI

Cylinder CGA:

A006-HP-350/BR

Analysis Method:

GC-TCD

Preparation Method:

Cylinder Contents (1):

Gravimetric

Component

Requested

Concentration (2)

Reported

Concentration (2,3)

Ethylene Oxide Nitrogen 50 ppm Balance 52 ppm

Balance

Authorized Signature:

(1) The fill pressure shown on the COA is as originally quoted. The fill pressure measured by the customer may differ from the fill pressure originally quoted due to temperature effects, compressibility of the individual components when blended together in the cylinder, gauge accuracy or reduction in content volume before shipping as a result of samples withdrawn for laboratory QC necessary to ensure product quality.

(2) Unless otherwise stated, concentrations are given in molar units.

(3) Vapor pressure mixes are blended at a sufficiently low pressure so as to eliminate phase separation under most low temperature conditions encountered during transport or storage. However, it is generally recommended that cylinders containing vapor pressure restricted mixes be placed on the floor in a horizontal position and rolled back and forth to improve homogeneity of the gas phase mixture before being put into service.

Analytical Gas Standards are prepared and analyzed using combinations of NIST traceable weights, SRM's provided by NIST, or internal gas standards that have been verified for accuracy using procedures published by the US-EPA. Pure gases are analyzed and certified for purity using minor component Analytical Gas Standards prepared according to the methods specified above. Balances are calibrated to NIST test weights covered by NIST test number 822/278982-10. Reference Certification #'s:1072/Z, 833/AB and 3280/H.

Calibration methods are in conformance with MIL-STD 45662A.

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